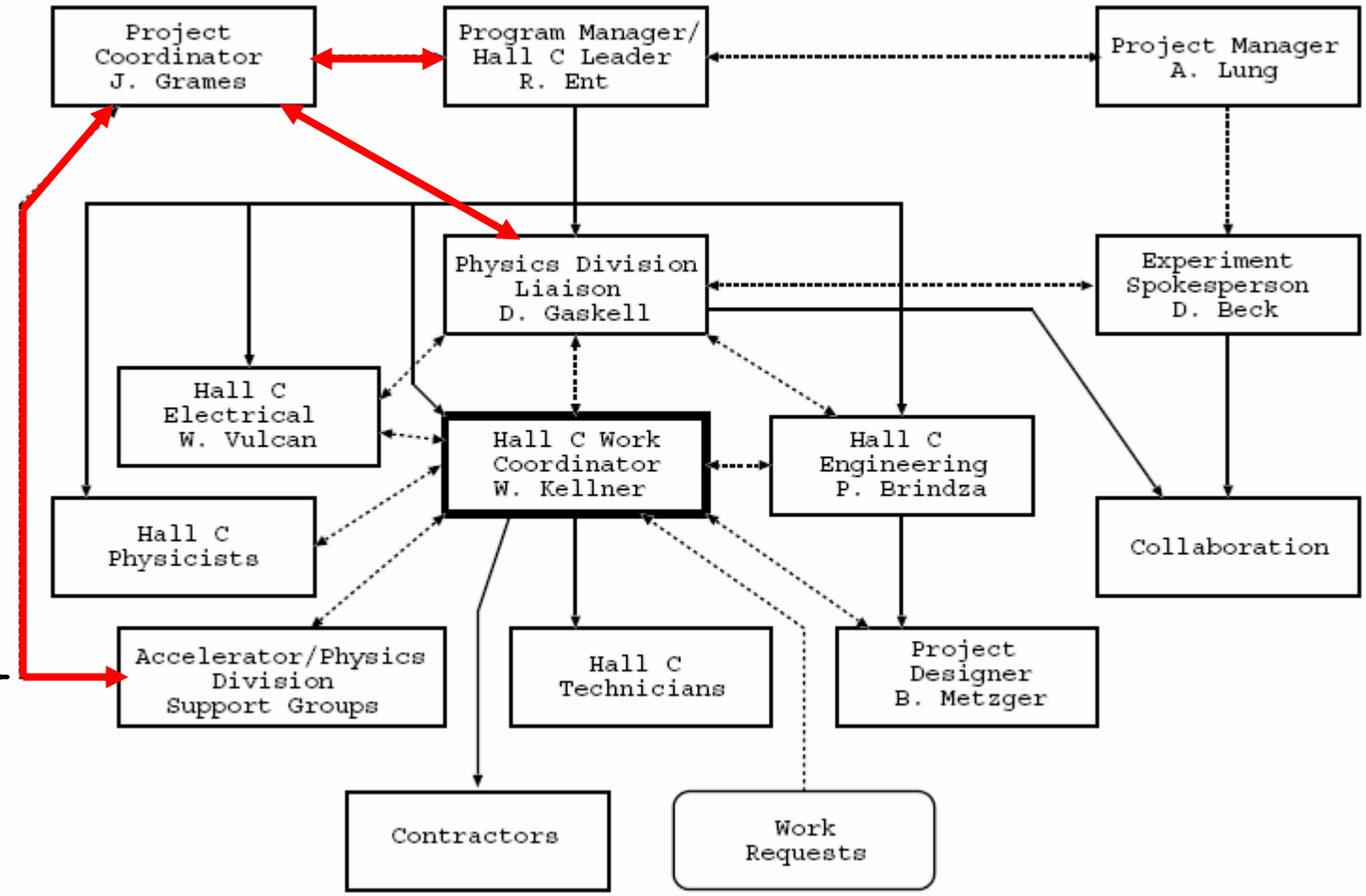
G^0 Backward Angle Accelerator Preparations

Joe Grames (G^0 Project Coordinator)

- Infrastructure & Planning
- Scope of Work
- CEBAF Preparations
  - Polarized Source
  - Injector
  - Accelerator
  - Hall C
- 2006 Program

Hall C Conduct Of Operations (COO) & Resource Allocation



Survey/Align.
Cryogenics
ME Design
Vacuum/Install.
CASA
EGG
EES
ACE
Operations
PSS
RadCon
Software

Scope of Work

Sep. '05 - Coordinated preparation begins

Oct. '05 – Extended Hall C down begins

Jan. '06 – Accelerator Shutdown

Firm Schedule

Mar. 15 – Apr. 2, Commissioning Period
(following long down)

Apr. 3 - Apr. 29, High Q^2 Run (687 MeV)
(3-halls, all polarized)

Tentative Schedule

Jul. 21 - Sep. 1, Low Q^2 Run (362 MeV)
(1-pass, 1-linac, 2-halls)

Sep. 22 - Dec. 22, High Q^2 Run (687 MeV)

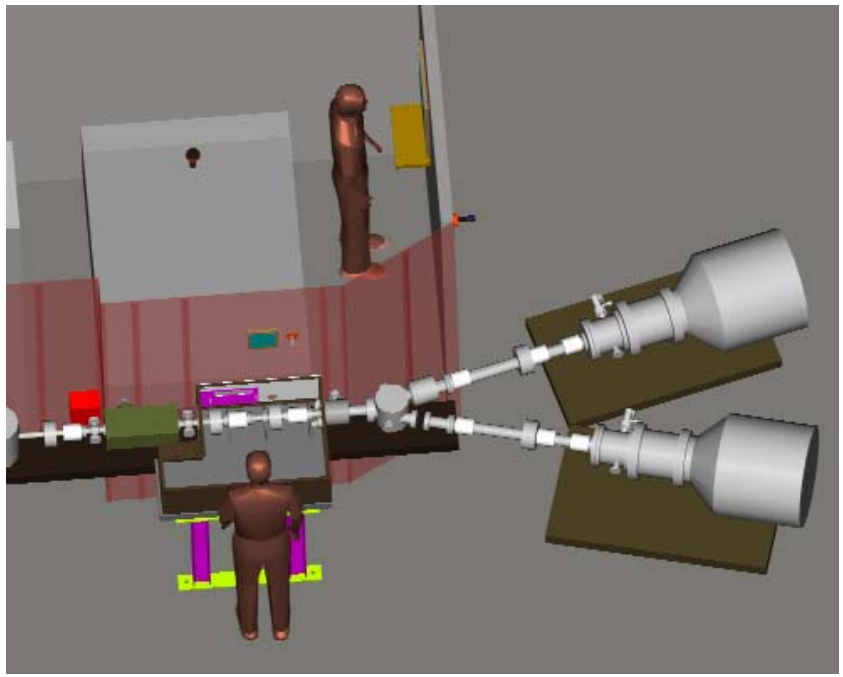
CEBAF Preparations – Polarized Source

Laser
Ti:Sapphire (780 nm)
f ~ 499 MHz

Parity Quality Laser Setup
G^0 Helicity Sequence

G^0 Ownership of InjDAQ

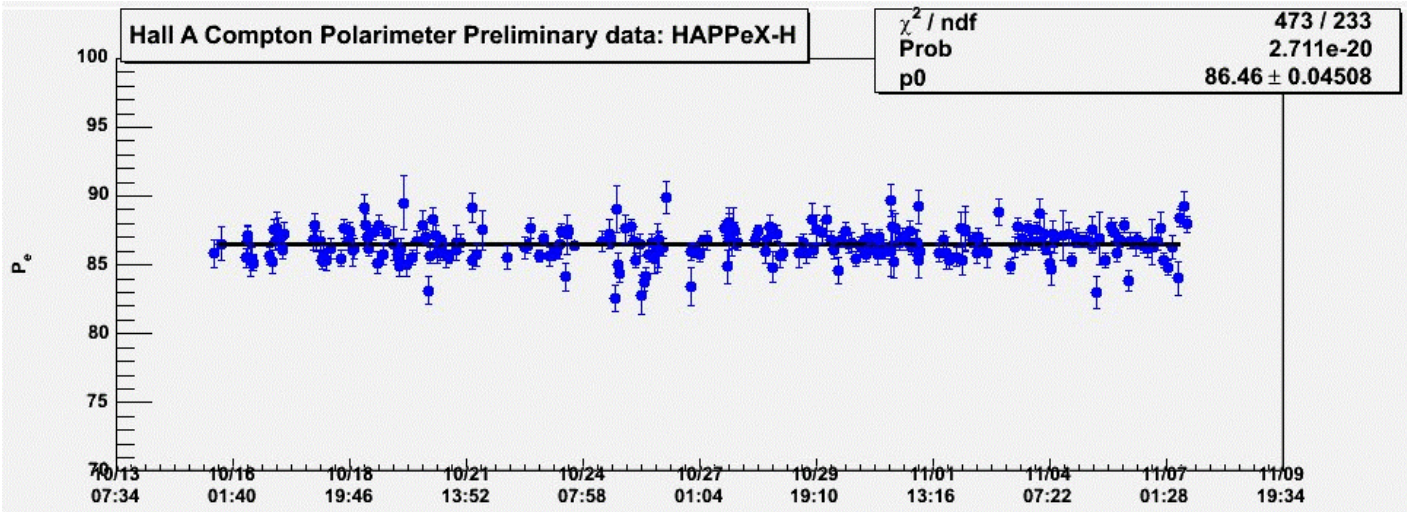
Pockels cell alignment
IA intensity FB
Rotatable ½-waveplate
Insertable ½-waveplate



Polarized Source
Gun2 (or Gun3)
Anodized
SL-GaAs
P > 80%
I_{beam} ~ 80 μA

CEBAF Preparations – Polarized Source

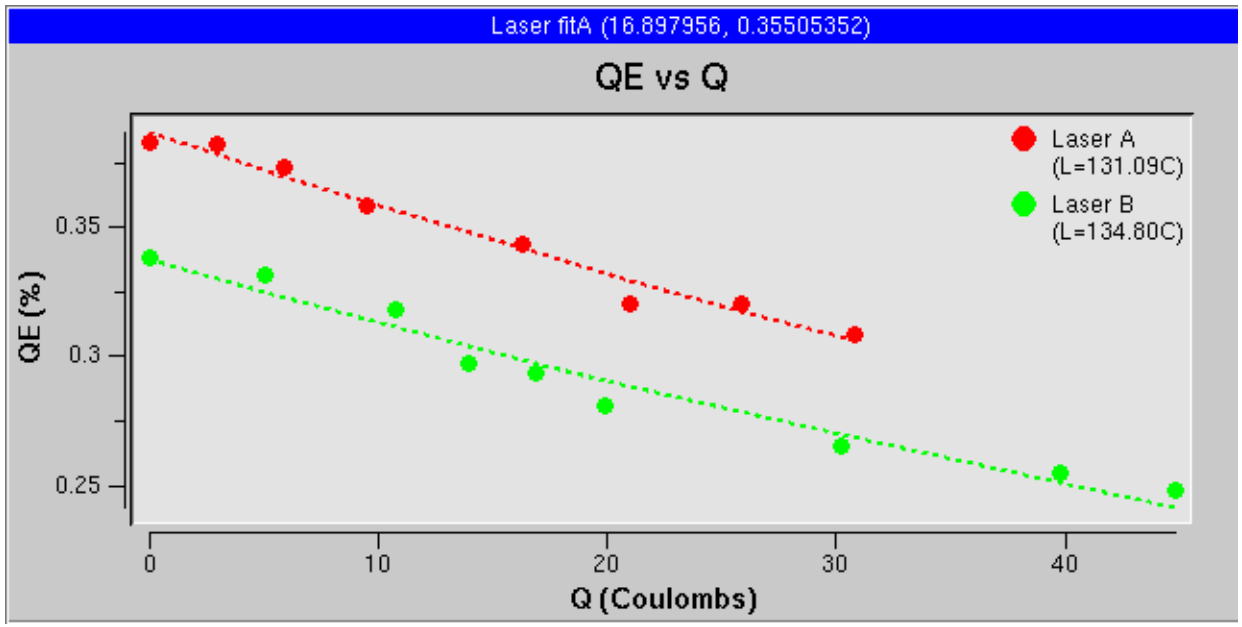
Polarization ~86%



Lifetime ~130 C

A = 20 μA
B = 5 μA
C = 80 μA

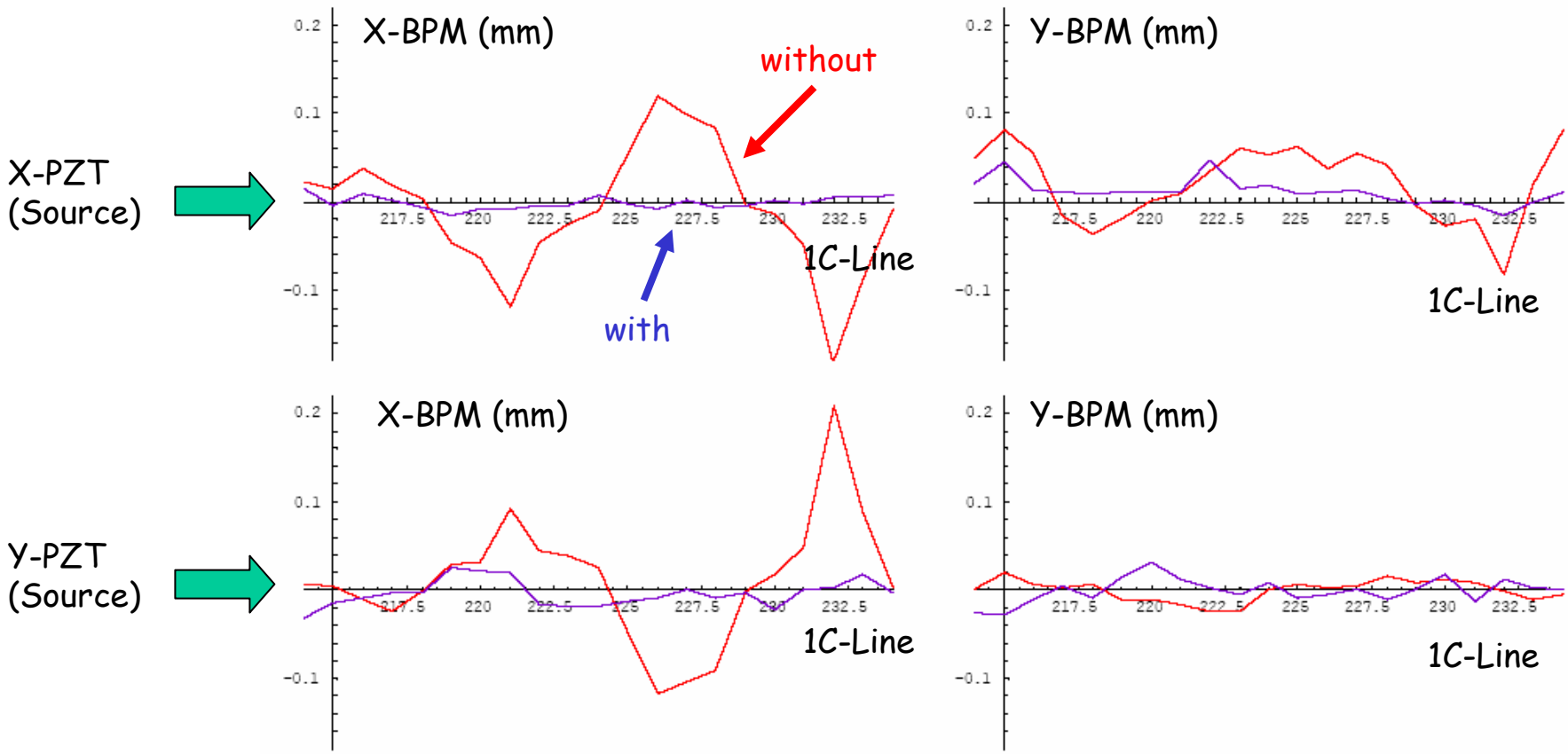
~10 C/day



CEBAF Preparations – Injector

Helicity correlated position differences generated at the source are suppressed by natural process of adiabatic damping (ratio of transverse to longitudinal momentum becomes smaller as beam is accelerated).

- "Matching" the beam emittance to the accelerator acceptance achieve damping.
- A poorly matched beam may result no (or larger) position differences.
- Matching in the accelerator proper (linacs & arcs) routinely demonstrated.
- Matching in the injector has been an arduous, long (~2 year) process.



Experiment	Photocathode	Charge Asymmetry at Target		Position Difference at Target	
		Spec	Achieved	Spec	Achieved
HAPPEX-I	Strained	1 ppm	0.4 ppm	10 nm	10 nm
HAPPEX-He	Superlattice	0.6 ppm	0.08 ppm	3 nm	3 nm
HAPPEX-H	Superlattice & Strained	0.6 ppm	2.6 ppm	2 nm	8 nm
HAPPEX-He (2005)	Superlattice	0.6 ppm	?	3 nm	4 nm (x) 17 nm (y)
HAPPEX-H (2005)	Superlattice & Injector Match	0.6 ppm	0.2 ppm	2 nm	1 nm (x) 1 nm (y)

GO requirements => <2 ppm <40 nm

CEBAF Preparations – Injector

Helicity Magnets

Will replace PZT mirror
(electron beam vs. laser beam)

4 magnets =>
position (x,y) & angle (x',y')

Linear, Independent, Electrically isolated
Fast rise time & correlated with helicity pattern
Orbit set in each helicity state (PZT set in one helicity state)

Resolution presently 100 nm/DAC step (at 5 MeV)
New DAC to be installed => 10 nm/DAC step (at 5 MeV)

CEBAF Preparations – Accelerator

PZTBooster Concept:

Injector matching process
- Time consuming
- Small amplitude signal

Helicity Magnets in new "Optics Mode"
- Runs triggered to BPM acquisition system
- Large amplitude signal

Goal:
- Streamline injector matching
- Improve accuracy of result
- Allow for rapid confirmation

CEBAF Preparations – Accelerator

Planning for accelerator proper (after injection & before extraction) is mainly directed toward the very low energy run, which exists on the tentative schedule.

To conserve electrical power the north linac will be ON and the south linac will be OFF (so that ARC1 can transport the beam).

We will retain cavities in SL for energy feedback only

Test of half pass extraction in December OK; require shielding in the extraction line to improve orbit control.

Tentative schedule A & C run together in this configuration:

We will extract to 5th pass line and use one RF separator

Test of 2-beam extraction in December demonstrated feasibility.

CEBAF Preparations – Hall C

Accelerator division support leading to installations/modifications:

- Install Moller kicker to allow high current polarimetry
- Move Moller quadrupole to reach low energy polarimetry
- Arrange focussing optics to improve spot size (halo?) control
- Install cyrogenics platform to meet safety requirements
- Re-install Halo & G0 girder, improve mating to G0 spectrometer

Accelerator division supporting preparations/calculations:

- Radiation analysis for beam dump at low energy, high current

Efforts now shifting toward checkout, beam delivery, commissioning plans, operations, & safety.

2006 Program

Presently in the Winter shutdown

Hall C work continues on schedule (Gaskell reports)

January activities

- Polarized source prepared
- Laser setup
- PQB source commissioning
- 5 MeV helicity magnets checkout
- Injector Setup & Matching
- Parity Quality Beam setup
- 2-beam extraction test